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ORIGINAL ARTICLES.

A SERIES OF OCULAR TUMORS PRESENTING SPECIAL POINTS OF INTEREST.

BY ADOLF ALT, M.D.

In the February number, 1889, of this journal, I published a number of *congenital* tumors, which I had operated upon. Among a larger number of congenital ocular tumors which I have since seen, the following two only are, perhaps, of more than common interest.

CASE I.—E. M., a white boy, nine years of age, was brought to my office on account of asthenopia due to some refractive error, January 24, 1893. Aside from this he had a "birthmark" on the right eye, which his mother liked to have removed. I found a yellowish-brown spot situated in the bulbar conjunctiva up and inwards, slightly raised over the surrounding surface and irregular in outline. Its size was about ten millimeters by four millimeters. I removed the little tumor with scissors and healing took place in a few days.

On microscopical examination it was found that the whole tissue beneath the epithelial layer consisted of large round

cells, filled with pigment granules to a varying degree. There was but very little intercellular substance and no connective tissue. No bloodvessel traversed the area of the little tumor.

This was then a *simple melanoma conjunctivæ.*

CASE II.—On November 16, 1889, L. M., a little girl, four months old, was brought to me by her parents who had noticed at once after birth a little yellow protrusion in the outer corner of the right eye. They were certain that this protrusion had been continually and slowly growing towards the cornea. The eye was held in a convergent position.

I found a yellow tumor with a smooth surface, which protruded from the outer canthus and, covering the sclerotic, had almost reached the corneal periphery in its growth. It was covered by the conjunctiva which was slightly hyperæmic and it could be moved to and fro to a certain extent upon the sclerotic. How far it might reach back into the orbit could at this examination not be made out.

When I advised the removal of this unsightly growth the parents at once consented. The operation was performed with general anæsthesia and presented no difficulty whatever. The tumor did not reach far into the orbit and was enclosed in a connective tissue capsule of its own in which I easily took it out as a whole. Several larger bloodvessels entered into this capsule, which bled profusely and an after-hæmorrhage took place during the following night, which I succeeded, however, quickly in bringing to a standstill by digital compression.

The tumor had the shape of a medium-sized chestnut, the thicker end corresponding to its orbital portion, while the thinner end lay near the cornea. It proved to consist solely of fat-tissue, and was, therefore, a pure *congenital lipoma.*

The following are cases of tumors which have grown in adult life, which either in their history, or in their clinical, or histological aspect are outside of the ordinary experience.

CASE III.—B. E. L., a mechanic, aged forty-six years, came to me on account of a disfiguring swelling of the left lower lid. He had noticed its slow growth for five years and attributed

its beginning to the fact, that he rubbed his eye very often with a dirty hand.

I found the inner third of that lid occupied by numerous roundish nodules, looking something like xanthelasmata. They varied considerably in size, the two or three largest ones were of the size of a pea. Some of these nodules were pitted. The felt hard, like epitheliomatous tissue. There was ectropium and the exposed conjunctiva was swollen considerably. The stillicidium and the increased itching and pain had brought the somewhat cowardly man to seek help. Although I intended to close the gap resulting from the removal of the portion of the lid which was the seat of the tumor by a larger plastic operation, he would not consent to it, as it would keep him from work too long. I, therefore, tried to simply close the gap and succeeded in doing it with some difficulty, after having performed canthotomy. In spite of the considerable strain on the sutures, only the one nearest the lid-margin gave way. During the healing process, however, the little coloboma resulting from this, flattened out to such an extent, that barely a little notch remained visible and the tears did not run over.

Although the aspect of the lid was not exactly that of an epitheliomatous lid, I thought, that it would after all prove to be affected with epithelioma. The histological examination, however, showed that this was not the case.

The epithelial coat was in places enormously thickened, in others less so. The subcutaneous tissue was highly infiltrated with round cells, but the bulk of the tissue of the lid was made up of glandular tissue, resembling the acinous type. Dozens and dozens of such glandular tubules were crowded together into a lobule, so to speak, separated from the adjoining ones by a thin septum of connective tissue which in places and especially along the enclosed bloodvessels is considerably infiltrated with round cells. This adenomatous tissue lies between the skin and the tarsal tissue. The Meibomian glands seem unaltered, although the tissue between them, too, is crowded with round cells. From the foregoing this tumor must be considered to be an *adeno-carcinoma of the eyelid.*

CASE IV.—N. R., aged twenty years, a very fleshy, but otherwise healthy girl, came to consult me in March, 1892, on account of excruciating pains in the right orbit, starting from the outer canthus of the right eye and running back into the orbit and upwards on the forehead. These pains were almost uninterrupted and kept her from sleeping. There was a slight degree of convergence and she saw sometimes double. The optic nerve was anæmic with correction was $^{20}/_{XL}$. During the following months, the pain remaining a constant and unyielding symptom and being always referred to the same place, I made an exploratory operation at the outer canthus and removed what I thought to be the hypertrophic palpebral lachrymal gland. On examination this proved to be correct, but the tissue between and surrounding the acini of glandular structure was highly infiltrated. A few days of rest followed the operation, but then the pain again came on. At this period the patient disappeared from my office. When I saw her again in June, there was continued blepharospasmus of the right side with profuse lachrymation whenever an attempt was made to open the eye. When separating the lids a small nodular tumor protruded into the conjunctival sac at the outer canthus. Vision was reduced to $^{20}/_{CC}$?, the optic nerve was very anæmic and there was decided convergence of the right eye. On June 17, I removed this tumor under chloroform. It was about the size of a small bean and consisted almost solely of glandular structure surrounded by highly hyperæmic and infiltrated tissue. This operation was followed by a general improvement of the existing conditions, particularly the pain. This improvement, however, did not last long and all the symptoms returned with renewed fury. The patient and her family begged me to remove the eye, to which I did not at that time consent. In October the patient returned to me. She said, that if I did not remove the eye, she would die. She had had no night's rest for many months without an anodyne, and, even the rest so obtained was broken and insufficient. She had lost twenty pounds of flesh since I saw her last. There was now some exophthalmus inward and downward. Vision re-

duced to fingers at 4″; beginning atrophy of the optic nerve. On palpation a roundish, hard tumor could be felt behind the outer upper margin of the orbit, evidently reaching farther back than I could feel. As I did not think I could get the tumor out fully, I first enucleated the eyeball. After its removal two distinct tumors could be palpated, one about the size of a large hazelnut lay right underneath the capsule of the orbital lachrymal gland and a smaller one somewhat farther back in the orbit. Both tumors were removed with scissors. The orbital lachrymal gland did not appear altered and was left untouched. Absolute euphoria followed the removal of these tumors and lasted for about three months. Then the pain returned, but is located in the right frontal region. The patient is losing appetite and flesh and no treatment seems to relieve her. No local relapse of the tumor has occurred.

The tumors like the smaller one removed in June consist in the main of lobules of acinous glandular tissue closely packed and surrounded by highly hyperæmic and infiltrated connective tissue.

This then is a case of *adeno-carcinoma of the palpebral lachrymal gland*, and seems to be unique.

CASE V.—J. D. T., aged fifty-eight years, consulted me in July, 1890, on account of his right eye. About nine months previously he had noticed double vision and for three months he noticed that this eyeball protruded more and more. I found a moderate exophthalmus in an inward and upward direction. The movements of the eyeball were restricted outward, outward and upward, and outward and downward. V= $^{12}/_{cc}$. Atrophy of optic nerve. A semi-soft round tumor could could be felt in the region of the lachrymal gland, reaching downwards to some extent.

After incising the conjunctiva over the tumor this was found to be enclosed in a tense fibrous capsule, evidently the distended capsule of the lachrymal gland. In the attempt to dislodge the whole tumor out of the fossa lachrymalis the capsule burst and the contents came out piecemeal before the whole sac was removed.

The tumor was a *typical myxo-sarcoma of the lachrymal gland.* Not a trace of glandular tissue could be found in numerous sections.

CASE VI.—H. D., aged fifty-three years, consulted me on account of a gradual failing of vision particularly in the left eye, on September 9, 1887. I found vision right normal, vision left $^{20}/_{XL}$?. Could read only Sn. VI with glasses correcting his presbyopia. I found anæmia of the optic nerve and retina, especially in the left eye. The patient was an excessive smoker and finding no other pathological change to account for the reduced visual acuity, I enjoined abstinence from smoking and alcohol and gave him strychnia.

On September 27 he had Left vision $^{20}/_{XXX}$ and could read Sn. III. He expressed himself as greatly improved. Ophthalmoscopically no change was visible.

On November 13 he returned, stating, that within a week his left eye had grown considerably worse, and that he had some pain in it. V.=$^{20}/_{CC}$. After dilatation of the pupil the retina could be seen floating behind the equator of the lens, in an outward direction. The intraocular tension being, if anything, higher than normal, surely not less, I told him that although this might be a simple detachment of the retina, it might be caused by an intraocular tumor. As I did, however, not feel justified in stating this to be a fact without doubt, he wanted me to see, whether treatment would not cure it. Two week's treatment with pilocarpine, recumbent posture and compressive bandage, produced no alteration of the condition of the eye; and the patient left me, with the injunction to report any noticeable change.

On February 2; 1888, I was telegraphed for to see the patient. He had had excruciating pains in the, now blind, eye for a week. I found a great deal of swelling of the lids and chemosis. The cornea was hazy, there was no anterior chamber, the cataractous lens lying close to the posterior surface of the cornea. + T2. He submitted at once to enucleation.

The tumor filled only a comparatively small part of the eye and concerned chiefly the ciliary body and the adjacent chori-

oidea. It was a *mixed pigmented sarcoma*, consisting of *round and spindle-cells.*

CASE VII.—J. B., aged seventy years, came to see me on account of blindness and pain in the left eye on September 11, 1893. Eight months previously he had noticed a cloud come suddenly over his vision from above and "vision was trembling." This was soon followed by photopsiæ. Detachment of the retina being diagnosed by the attending oculist, he submitted to six weeks of treatment by pilocarpine, rest, etc., under which, he states, he grew daily worse. Three weeks previous to his visit to my office, the eyeball had suddenly become very painful.

I found some ciliary injection. The pupil was wide, but no reflex could be obtained from the fundus. + T 2. V.=0.

The diagnosis of intra-ocular tumor was verified after the enucleation to which he promptly submitted. In this case the tumor of the size of a small hazelnut sat close to the optic nerve entrance and was in the main *an unpigmented small spindle-cell sarcoma.* In the center of its base, however, there was a portion which consisted totally of *myxomatous tissue.*

CASE VIII.—Mrs. W. B., aged thirty-three years, consulted me on March 5, 1884, on account of glaucoma chronicum inflammatorium of both eyes, particularly of the right eye. Vision was reduced to $^{20}/_{CC}$ in this eye and to $^{20}/_{L}$? in the left. Iridectomy was performed in both eyes, which two years later (in 1886) was followed by a sclerotomy of the right eye. Compound hypermetropic astigmatism, against the rule, in either eye was corrected by glasses and vision thus was brought up to $^{20}/_{LXX}$ in the left and $^{20}/_{XXX}$ in the right eye. In 1891 the patient consulted me about her glass for the left eye. At that time her right eye showed glaucoma absolutum and was at times painful. The advice to have it removed was not accepted. In June, 1893, patient called on me again on account of long continued attacks of pain. There was now glaucomatous cataract and the eye bulged somewhat at the cornea-scleral scar. Enucleation was again advised and refused. Finally, on August 17, she submitted to removal of this eye.

To my astonishment I found, on opening it after a few weeks, that it contained a good-sized *pigmented round-cell sarcoma of the choroid* which was on the point of breaking throw the iridectomy scar.

CASE IX.—A. F. K., aged thirty years, when calling on me on April 4, 1888, related that six months previously his left eye had been struck by a missile from a bean shooter. There was no external wound visible at the time, although the eye was painful for several days. Two months ago, he noticed a feeling of fullness and pressure in that eye, and it soon after became painful and visibly inflamed. Vision now became rapidly abolished and gradually the eye showed a bluish black spot which protruded and occupied the locality of the original injury.

I found a blind eye with a considerable ectasia reaching from the equator to the cornea on the outer side of the eyeball. The pupil was wide, the iris discolored and, what appeared as a cyclitic membrane, was seen behind the semi-transparent lens. The eye was harder than normal and the possibility of an intraocular growth being explained to the patient, he reluctantly consented to have the eye removed.

What had appeared to be a cyclitic membrane, was a *pigmented round-cell sarcoma of the choroid*, covered by retina, which filled almost the whole of the vitreous cavity.

Although it is, of course, not certain whether this tumor did not exist before the injury, yet this is not likely, as the intelligent young man would probably have noticed something of it. It seems to me, therefore, that we have to deal with a choroidal sarcoma caused by an injury to the eyeball.

CASE X.—Mrs. E. W., aged thirty-nine years, came to see me on April 4, 1885, two years after having suddenly got blind in the right eye after witnessing a fire which consumed her husband's box-factory. From this blindness she had slowly recovered. Of late she has had attacks of considerable pain in this eye which are always accompanied by redness and swelling.

I found that the pupil was dilated and she had an eccentric

vision of $^{8}/_{cc}$. Near the optic disc, and below and outwards from it, the retina was seen to be abruptly raised for the distance of about two optic disc diameters, from where the raised tissue gradually sank to the level of the surrounding retina. At this place small pigment patches and several hæmorrhages were seen. The retinal bloodvessels passed over the raised spot.

I explained to her the likelihood of the presence of an intra-ocular tumor and after a few day's hesitation and repeated examinations, I got her consent to enucleate the eye.

A flat tumor of about four millimeters thickness was found in the choroid at the locality mentioned, to which the retina was firmly attached. It was a very vascular *semi-pigmented sarcoma consisting of round and spindle-cells.*

On August 17, of the same year, patient called on me again on account of a small pigmented point on the conjunctiva near the lachrymal caruncle. It was no larger than the head of a pin and I removed it at once. It consisted solely of pigmented round-cells. The patient has since been well.

SELECTIONS.

CASE OF THE TUMOR OF THE OPTIC THALAMUS

BY WHARTON SINKLER, M.D., PHILADELPHIA.

Miss A., æt. 46, had always enjoyed excellent health and had been of a cheerful and even temperament. Menstruation has been regular and painless until within the past year, when the flow has been excessive.

In January, 1893, the family thought she was rather dull and took less interest in things than usual, but at the time this attracted but little attention. The end of March, just after returning from a trip to Cuba, it was noticed that there was a marked tendency in the patient to be gloomy and morbid in her expressions, and she seemed to be indifferent to many things which had formerly interested her. Her manner became listless and there was a constant desire to lie down and sleep. The sleep was not light or natural, but was very heavy and deep and lasted for four or five hours at a time during the day. She complained at this time of a great deal of difficulty of vision, and went to Dr. Risley for a change in her glasses. He kindly sent me the following report:

"Miss A. came to me on March 22, complaining of the recent rapid increase of her myopia, but said that she had no pain in eyes or head. She said she had formerly suffered much from headache, but not of late, and was able to use her eyes with impunity until quite recently, and then found fatigue only after prolonged use. She complained only of her dim distant vision. With a carefully selected glass vision was one-half in each eye. The note made is as follows:

"The anterior sclera is thin, perforating vessels distended, but the ophthalmoscope shows only a small crescent at the temporal margin of both nerves and the posterior part of the eye-ground not in bad condition. Range of accommodation normal and no marked want of muscular balance.

"She received a mydriatic which was used until the twenty-ninth, when her correcting glasses were ordered, the vision having risen to normal in each eye. I have observed at the first visit an unusual slowness of speech and hesitation in calling the test letters, but not being familiar with the patient thought it possibly characteristic, as she was sluggish in all her movements, sank deeply into her chair and replied slowly to questions. In one week she returned for a reading glass, complained of some confusion of sight and that she was not feeling well. The disturbance of vision was apparently due to some hyperphoria, but it was variable and uncertain, and her vision was not quite as good as when the glasses had been ordered one week before. The field for form was normal, color field not taken. The ophthalmoscope revealed no change in the eye-ground.

"In about ten days she returned, when I was much struck by the evident rapid failure in her health, and I found that vision had sunk to one-half again, but the ophthalmoscope revealed no visible change in the fundus. It was now plain that the mental sluggishness had increased, as she was a trifle petulant and seemed averse to any effort, even to reading the test letters. She seemed to be hysterical."

She was disinclined to talk, and was averse to giving an account as to how things appeared to her. The listlessness and apathy increased from day to day, and about the middle of April the expression of the face began to show marked change and became vacant. About this time there was slight aphasia, which was only noticeable, however, to those who were constantly with her. The aphasia was not marked, and consisted merely in the occasional miscalling of a word. After a period of somnolence, which lasted two or three weeks, there came a tendency to restlessness. She walked up and down the room

a great deal and seemed slightly unsteady in her gait, occasionally taking hold of the back of a chair to support herself. When asked why she walked so much, she said that her legs felt weak and as if they would give way, and she thought that exercise would strengthen the limbs.

The next symptom observed was paresis of the right side of the face, the left corner of the mouth being drawn up in smiling and talking. Her hands seemed unable to guide themselves; for instance, she would have difficulty in lifting a cup directly to her mouth, and the inco-ordination was rather greater in the right hand than in the left. She had always been somewhat left-handed, but it now became noticeable to her friends that she used the left hand much more frequently than formerly. The use of her fingers became awkward and feeble. She could scarcely button her gloves, or even draw on the fingers, and in all small movements she showed a feebleness of the hands; for example, she could play a good game of cards, but could not shuffle the cards, and if they dropped out of her hands she either did not see them, or else made no effort to gather them up. There were never any choreic movements. The general health was fairly good, the appetite was good—if anything, unusually large for her. She sometimes complained of headache, but there was no constant headache and the pain did not appear to be very severe.

About May 1, Dr. Goodell made an examination with the view of determining the reason for the menorrhagia which had existed for several months, He found that there was a small fibroid of the uterus, but discovered no other abnormal condition. On the day that she visited Dr. Goodell's office, which was the last time that she was out, she walked several squares going to and from his office. She had insisted on walking, as she thought she would prefer it. She walked, however, with great difficulty, her gait was very slow and feeble, and she staggered so much that she had to lean heavily upon the arm of the person who was with her to keep herself from falling.

I examined Miss A. on May 4, 1893, and found a well-developed healthy-looking woman. She was dull and hard to

arouse. It was difficult to get her attention, and she answered questions slowly and with apparent indifference. There was generally a long interval between the question and answer and the replies seemed to be made at random. She said that she had pain in the head, and placed her hand on the forehead to show where the pain was. At times the pain seemed intense. There was marked paresis of the right side of the face, which was more apparent when the patient smiled. The right eye, however, could be fully closed. Sensation was impaired on the right side of the face, but was not lost. The point of a pin could not be distinguished from the head, but localization was good. The tongue was protruded straight. The grasp of the right hand was almost equal to that of the left. Sensation in the hand and arm was not affected. There was some awkwardness in the use of the hand, and the patient kept moving the fingers as if they felt unnatural, but she could not be made to say that there was any unusual feeling in them.

She moved the legs freely in every direction and felt and localized touch in them, but in attempting to walk staggered considerably and would have fallen if she had not been supported. The knee-jerks were exaggerated, but there was no ankle clonus. The patient slept heavily a large part of the time and was difficult to arouse; but at times was extremely restless.

The bowels were regular and the urine passed as usual. The urine contained no albumin or sugar.

The appetite was large, almost voracious, and there was no nausea or vomiting. The temperature was normal, or subnormal, at times as low as 97°, and the pulse slow, varying from fifty-six to seventy beats in the minute.

Dr. Risley made another examination of the eyes about May 10, and found that the fundus was normal in both eyes. There was no nystagmus, and the pupils respond to light and accommodation.

The symptoms gradually increased in severity. The somolence grew deeper and the difficulty in the use of the right arm increased. There was marked inco-ordination in the use

of the hand, and at times the fingers were in positions somewhat like those of athetosis. At times there appeared to be complete paralysis of the extensors of the hand with contraction of the flexors, and this condition would pass away. Later the right leg became helpless, and at intervals there was loss of voluntary power to move it. As the patient became worse there were involuntary discharges from the bladder and bowels. She very gradually sank, and, after being in a completely comatose condition for three days, died. Three days before death the temperature rose to 103° and rapidly went up, reaching 107° before death.

There was at no time any convulsive movement, either local or general.

There were several points of interest in the case. First, as to whether the condition of the patient was due to hysteria, or to organic disease of the brain. The gynecologist who examimed her a few days before I first saw her, thought that she was suffering from hysteria, and when I made my first visit there were many features which looked like hysteria. She seemed to assume some of her symptoms.

It was evident that a careful examination that there was a gross brain lesion and the indications pointed to a growth, the entire absence of fever being against the probability of abscess. The question of localization of the tumor was the next question of importance. From the fact that one of the early symptoms had been slight aphasia followed by facial paresis, and later incomplete loss of power in the arm and leg with symptoms of intracranial pressure, as shown by somnolence and pain, it seemed probable that the growth was located in the left frontal lobe, and that it had gradually encroached upon the motor region. In this view Dr. H. C. Wood, who saw the case with me, concurred. Another point which naturally came up was the question of operation, and the family having seen a paper on brain surgery by a prominent surgeon, in one of the popular magazines, were very urgent that an operation should be attempted. The patient's general condition and the probable location of the growth, made any interference of this

kind seem inadvisable, and we decided against operation. The sequel shows how well it was that no operation was attempted.

The autopsy was made twenty-four hours after death by Dr. C. H. Burr. The head only was examined. The skull was of normal thickness and the membranes were free from disease or hyperæmia. The surface of the brain showed no unusual appearance, and on making horizontal sections through the organ there was no unusual vascularity or areas of softening. On opening the ventricles only a small amount of cerebro-spinal fluid flowed out. When the basal ganglia were exposed it was seen that on the left side the optic thalamus was as large as a hen's egg, the enlargement extending in all directions and involving the posterior part of the corpus striatum. The surface was smooth and covered with numerous large vessels. The consistency was firm and elastic.

The caudate nucleus and the lenticular nucleus are not at all involved. The internal capsule is involved only from pressure. On microscopic examination the growth proves to be a fibro-glioma.

The functions of the optic thalamus are so little understood, that the study of any cases in which this body is found to be exclusively involved, or even to a large extent the seat of disease, is of importance.

Dana[1] says that lesions of the posterior part of the thalamus will produce partial blindness. "Aside from disturbances of vision, the optic thalamus also must be considered clinically a latent region."

Gray,[2] referring to lesions of this body, asserts that "these can not be diagnosed.

Gowers,[3] however, goes at some length into the symptoms which has been observed in connection with diseases of the thalamus. He states that slight hemiplegia has been observed

[1]Text-Book of Nervous Diseases, p. 232.

[2]Nervous Diseases, p. 126.

[3]Diseases of the Nervous System, p. 714.

when the disease has been near the middle third of the thalamus; and that also when this portion is involved, mobile spasm is liable to exist on the opposite side of the body, chiefly in the hand. He observes that as to sensory changes, "these do not exist when the disease is limited to the thalamus, but that hemianæsthesia occurs when the lesion has extended to the internal capsule outside of the pulvinar; and that in such cases, there may also be hemianopsia." He also believes that this symptom may be caused by disease limited to the posterior part of the thalamus. In a case which I shall report, hemianopsia was not present.

Meynert thought that muscular sensibility is affected by disease of the thalamus.

Within the past few years a number of cases have been recorded in which, post-mortem, the thalamus has been found diseased, but the symptoms have varied greatly. Of course, the lack of uniformity in the symptoms depends on the involvement of parts adjacent to the thalamus and of necessity, it can occur but rarely, that the thalamus is the exclusive seat of disease. Lesions of the thalamus frequently extend into the internal capsule or into the pons and thus give rise to symptoms characteristic of disease of these parts.

Ott has made some interesting observations in regard to the thalamus as a heat center. His experiments on rabbits showed that irritation of the anterior and inner portion of the thalamus caused marked rise in the temperature of the animal. His observations have been confirmed by other observers. In this connection it is interesting to note that in the case which I shall relate later, the temperature at first was subnormal, and before death became enormously elevated.

Lloyd[4] has reported a case in which there was a glioma of the left optic thalamus, but also involving the mid-brain adjacent. In this patient there was brachial and crural monoplegia, with paralysis of the left third nerve. There was intense hebetude, so that the examination of the sensory conditions

[4]Journal of Nervous and Mental Diseases, December, 1891.

was unsatisfactory; but it is stated that there was no apparent anæsthesia, and that there was an active reflex to sensory irritation.

Dercum[5] has also made some interesting observations on a case of tumor of the thalamus. In this case the tumor involved principally the pulvinar, but to some extent the caudate nucleus, and there was some evidence of pressure upon the posterior third of the interior capsule. The patient had hemianopsia, loss of vision, and the Wernicke pupillary reaction, but no optic neuritis. There was complete hemiplegia and hemianæsthesia on the side opposite the lesion. In the early history of the case there were athetoid movements of the right arm.

Dr. Robert T. Edes[6] relates a case of tumor of the thalamus. The patient, a man of 24, had shown symptoms of brain disease for a period covering six months. At the autopsy nearly the whole left thalamus was found involved by the growth. The caudate nucleus was pushed forward by it, and the hippocampus was also compressed, but was not involved. The posterior part of the posterior limb of the internal capsule, however, was invaded by the growth. The tumor was a glio-sarcoma. The prominent symptoms presented by the patient were a sense of numbness and heaviness of the right side, with anæsthesia later in the history of the case. There was slight paralysis of the left side of the face and body, but this was somewhat intermittent. There was headache and dullness of the mental faculties, persistent vomiting, and one or two attacks of unconsciousness. Sleepiness and stupor were conspicuous symptoms. There was some diplopia, but no optic neuritis, and the fields could not be determined owing to the patient's mental condition, but vision seemed normal. Pupils reacted equally to light. There was some forgetfulness of names, but no actual aphasia. There were no choreic movements.

The writer gives brief histories of nine cases which he has

[5]Journal of Nervous and Mental Diseases, August, 1890.

[6]Medical Record, May 24, 1890.

collected, in which there was a tumor of the optic thalamus. In these there was no uniformity of symptoms, but the symptoms most commonly observed were somnolence and impaired sensibility, and paresis on the side opposite that on which the tumor was found. Disturbance of vision was noted in a comparatively small proportion of these cases. It must be stated, however, that in most of the cases quoted there was more or less involvement of the lateral capsule and corpora quadrigemina, and hence the symptoms of paresis and hemianæsthesia may be ascribed to the lesion of the internal capsule.—*University Medical Magazine.*

TUMOR OF THE IRIS.[1]

BY J. SCHNEIDER, M.D., MILWAUKEE, WIS.

Tumors of the iris not caused by infection, such as syphilis or tuberculosis are very rare in our clinical experience, and when seen the majority have arrived at that stage of development when the integrity of the eye has been so changed that in order to arrest farther and more serious consequences there remains but one alternative, that of enucleation. In the literature on the subject I have not been able to find a similar case, and in my personal experience but this one, where after the removal of such a tumor from the iris there has remained useful vision; and in the light of these facts I consider the following case very unique in its clinical and anatomical results:

Miss M., of Iron Mountain, Mich., consulted me with reference to a disturbance in the vision of her left eye. On awaking the morning of March 29, 1892, she noticed the sight of the eye much reduced and objects seen with it appeared a dark red color. On March 30, 1892, the patient came to me, when I found the following conditions: R. E., normal; L. E., ability to distinguish the movement of a hand at ten feet; peripheral perception of light normal; no pain; no inflammatory symptoms. The anterior chamber was filled with blood; external layer of the cornea normal, but the lower temporal quadrant of the middle and internal layers were hazy, the haziness extending four or five mm. into the cornea; tension somewhat increased.

After ten days' treatment the blood in the anterior chamber

[1]Read in the Section on Ophthalmology, at the forty-fourth annual meeting of the American Medical Association.

had disappeared, at which time I was able to make an examination of the deeper structures. The vision was $^{20}/_{XXX}$; colors and field of vision normal. In the lower temporal quadrant of the anterior chamber was lying a mass partially filling in the space between the iris and cornea, but touching the cornea near the corneo-sclero junction only, thus leaving a shallow anterior chamber above the growth. It could plainly be seen that the neoplasm had its origin in the ligamentum pectinatum iridis, and extending nearly to the sphincter pupillaris, filling almost completely the lower temporal quadrant. In consistence it appeared medullary, reddish yellow in color, shaped similar to a half coffee bean with the flat side lying directly upon the iris. The portion of the growth nearest the corneo-scleral junction being pressed upon by the cornea was flattened and grayish white in appearance; the remainder appearing very vascular and studded with papillæ. When a light was reflected directly upon the growth it could plainly be seen that the tumor grew directly out from the iris. The longest diameter was 9 mm., the shortest 5 mm. The crystalline lens and vitreous were apparently normal; reaction of pupil to light, and appearance of iris as far as the periphery of the tumor, were normal. The outline of the optic disc in the lower temporal quadrant was blurred; this cloudiness, for the distance of a disc diameter, extending into the retina and finally blending by means of white streaks in the normal tissue of the retina.

The patient was 16 years of age, menstruated regularly since her twelfth year, rather anæmic, had never had any severe illness, body well nourished, family history tuberculous, but repeated examinations for symptoms of phthisis and syphilis always giving a negative result.

The parents state that at the age of 5 years the girl was injured in the left eye with a fork; five months later they noticed a small brown spot near the pupil. This spot did not change till four years ago when with no apparent cause it assumed a flesh color and began to increase in size. After several examinations I recommended, especially on account of the family history, that the growth be removed, but it was not agreed

to by the parents and for some time the patient passed away from observation.

On March 24, 1893, the patient returned, complaining of a dull pain in the eye, tearing, sensitiveness to light with recurrent hæmorrhages (the patient could produce a hæmorrhage at will by pressure upon the growth). During the period of her absence the neoplasm had grown in all directions extending upwards so as to cover one-third of the pupil; tension increased, cornea hazy and vision reduced to less than one-half of the normal. The optic disc and retina showed marked symptoms of pressure atrophy. We have to take into consideration that we have before us a solid, flesh-colored tumor, very vascular and probably not the product of a general dyscrasia. The tumor is indefinitely located, non-pigmented, the surrounding parts, *i. e.*, the iris showing no pathological changes.

On account of the family history I was inclined to consider it a solitary tubercle or so-called granuloma. The negative results of the physical examinations would not be positive proof against a tubercle, for we know from Gradenigo, Perls, Haab, Cohnheim, Knapp and others that tubercular degeneration can be localized in the iris without any constitutional symptoms. Prudden, Haab and others affirm that granulomata have for their origin the irritating effects of some micro-organism. Second, granulomata are poorly organized neoplasms, infectious, inoculable and invade neighboring tissues, especially those with which they are in direct contact. The granuloma undergoes, on account of its poor vascularization, cloudy swelling or fatty degeneration. Aside from these authorities, the clinical appearance of the neoplasm made me doubt the existence of a tubercle. I was inclined to consider it a non-pigmented sarcoma, but the age of the patient and the clinical appearance of the growth were evidences against a sarcoma. We can immediately exclude all neoplasms of the iris such as gumma, epidermoid cyst, cystoid degeneration and melano-sarcoma.

On March 28, 1893, the growth was removed in the follow-

ing manner: After the eye was thoroughly cocainized, at a distance of $1^1/_2$ mm. from the corneo-sclero junction I made a linear incision, passing partially through the base of the tumor. With an iris forceps I attempted to seize the mass but it being so fragile, only small particles could be removed; with a platinum loop I made similar attempts with the same results, it being very evident that the iris was attached to the capsule of the lens. With an iris forceps armed with a double row of teeth I seized the iris on either side of the tumor and with some some little effort withdrew the large mass and attached portion of the iris out of the anterior chamber, which mass was then excised as close as possible to the base. (There still remained some parts of the growth broken off by the manipulations, in the anterior chamber). After the growth and the attached part of the iris were excised there followed a severe hæmorrhage. After the hæmorrhage had ceased and the lips of the wound were adjusted, I applied a pressure bandage and put the patient to bed. During the healing process the eye showed but very little reaction and on April 23, 1893, the patient was discharged with tension normal, and, with the exception of a small zone, the former corneal haziness had disappeared, some pigmented spots upon the capsule in the coloboma; lower temporal quadrant af disc pale, retinal changes disappeared and vision $^{20}/_{XXX}$.

The tumor measured 7 mm. in its longest diameter, 5 mm. in its shortest and 3 mm. in thickness; its superficial surface was uneven grayish-white, with the base showing normal appearance of iris. After its removal the tumor was placed in a sodium-chloride solution, and shortly afterwards given to Dr. Tower, of Milwaukee, for microscopical examination, who reports as follows:

"I took small particles, every precaution being taken to prevent them from being contaminated and planted them in tubes of agar, blood-serum, gelatin, and in bouillon both acid and alkaline, and kept them at 37 degrees centigrade and also at about 20 degrees centigrade for several days, and was unable to get any growths except in one tube a little penicellium

which was a contamination from without, either from the air or some of the utensils used. I examined stained preparations for the tubercle bacilli with negative results; in fact, did not find any germs at all or evidence of them.

"I have made examinations directly of small portions when fresh, under the microscope, and found a connective tissue and epithelial growth from apparently the iris. Upon section and examination, I find the growth to be a papilloma originating from the sub-epithelial connective tissue of the iris."

We understand by a papilloma, a neoplasm composed of connective tissue with epithelial covering; with very complete vascularization, resembling in construction skin, intestinal and mucous membrane papillæ (Wagner). Papilloma start usually from an injury, producing increased circulation to the part, causing a similar irritation to that produced by dirt in the formation of warts and by decomposing glandular secretions in the formation of condylomata. Such a papilloma may originate in any tissue as they are found in cystic tumors of the broad ligament (Mouillin), the skin, tongue, larynx, conjunctiva, fore-skin, glans penis, rectum, synovial membranes. If the tumor under consideration had been a leprous, tuberculous or actino-mycotic growth, the germs characteristic of these growths would have been found. If it had been any of these, or a syphilitic growth or a rhino-sclerotic, the particles remaining in the anterior chamber would have developed into a new growth.

I consider the prognosis in this case very favorable; especially on account of the age of the patient if there were particles remaining there would be no probability of the formation of a villous carcinoma, into which the papilloma sometimes develop.—*Jonrnal of the American Medical Association.*

CATARACT EXTRACTION WITH THE IRIS RETRACTOR.[1]

BY FRANCIS VALK, M.D.,

Instructor in Diseases of the Eye, New York Post-Graduate School and Hospital, Etc.

Since the early part of 1887 I have performed the operation for the removal of cataract by a method somewhat different from that usually adopted.

This I have placed before the profession at the Post-Graduate School, at the State Society, and also at the meeting of the New York Academy of Medicine; but, owing to unforeseen circumstances, there has been no opportunity for my colleagues of New York City to criticise or to discuss the merits or demerits of the retraction of the iris and the removal of the lens *at the same time.* I have therefore asked the honor and the privilege of bringing this matter before the Congress, that it may meet with a full and fair discussion.

I shall always highly appreciate the opinions and suggestions of those who entered this special branch of surgery before I attempted to step on the first round of the ladder of fame, as well as the remarks of those who are working side by side with me in trying to advance this noble art, even though our efforts may not meet with the approval of all. Still, we hope these are but steps forward, if I may call them such, that they may some day fall into the hands of men who may so improve them as to produce far better results.

I do not propose to discuss the merits of the different meth-

[1]Read before the Section in Ophthalmology of the First Pan-American Medical Congress.

ods for the removal of the sclerosed lens which intercepts the rays of light, nor the special features of an operation with or without an iridectomy, as the advantages of a round and normal pupil are well known and obvious. Nor yet do I believe there will ever be a day when the conscientious surgeon will adhere strictly to only one method of operation, but will always adopt that which he thinks best for the ultimate good of his patients.

Therefore it is my intention in this paper to suggest some thoughts and a method that have occurred to me in the course of my limited number of operations, and to explain the use and advantages of the simple little instrument, "the iris retractor," that I have used whenever possible during the past four years.

As regards the *time to operate*. I think this should be decided, when we find the cataractous lens sufficiently hardened to admit of its ready removal, without any reference to what the vision in the other eye may be. If our patients are willing to have an operation performed, even though the vision may be good in one eye, say $^{20}/_{LXX}$, then you are justified in taking the slight risk there may be of failure, for the benefit of the improved binocular field of vision. The blindness on one side renders our patients at a disadvantage, as some of my cases will show; at the same time we make a useless eye ready for practical vision when its fellow lens becomes opaque.

Preparation for the Operation.—We may do nothing as regards the ultimate success except so far as we may have the mind of our patients completely at rest. In the light of the present statistics, the chances of failure in a healthy eye, if a cataractous eye can be healthy, are very small, as you may readily see by the reports of cases lately published. So I do not in any way prepare my cases beforehand, and particularly avoid the use of atropine before the operation.

Operation.—At the time when I am ready for the operation I instill a sufficient quantity of a solution of cocaine (four per cent.) to render the cornea anæsthetic, but not to dilate the pupil. The patient is then placed on a steady table or bed with a good clear light on the eye, and the lids are opened

with the speculum. The eye is then washed with a solution of boric acid, while my instruments are all placed in boiling water and then on a clean towel and covered until wanted.

Section.—This I consider the most important part of the operation, as upon a good section, I believe, depends the ultimate success. This should be in the same plane, except at the finish, as I shall describe. I wish to avoid the conjunctival flap, and by the perfect coaptation of the wound in the cornea we may avoid slow healing, septic infection, and prolapse or incarceration of the iris. I make the section either upward or downward according to the eye to be operated upon—as upward in the right eye, downward in the left, or, if the operator is ambidextrous, then both sections may be made upward, as I consider the upward section preferable. I prefer, in making my section, to cut always toward myself, for in so doing we produce a much smoother and clearer cut. I always make the puncture and counterpuncture wholly within the corneal tissue, through the transparent margin, about one millimeter from its periphery, and so that the cutting edge of the knife will just cover the pupillary edge of the iris on the side toward which I propose to make the section. If possible, I rapidly make the section of the cornea with three distinct cuts: first, carrying the point of the knife, as soon as the counterpuncture is made, upward and forward, cutting one side of the cornea; then the heel of the blade is drawn upward and backward, so cutting the opposite side; then, turning the knife on its long axis, the section is completed with the third cut by pushing the knife steadily forward until released. I think De Wecker, of Paris, first suggested this method, and I prefer it to all others. As I complete the section in the above manner, the knife comes out some distance from the scleral junction, leaving room for the iris to be tucked in when drawn back by the retractor.

At this time we may have prolapse of the iris; if so, it must be returned with the spatula if we wish to save the iris; but, if not, then it may be drawn out and cut off if we decide an iridectomy is best. Another complication that may occur at

this stage, particularly in very old people, is the rupture of the capsule or the zone of Zinn with the presentation of the lens at the section; if so, it must be removed at once by pressure on the cornea. I am inclined to think that should there be any tendency to prolapse at this stage, it is better to perform an iridectomy at once, to prevent any future prolapse as the healing process proceeds. If no complications arise, I then proceed to open the capsule by a peripheral incision, passing the cystotome inward to the pupillary space, then under the iris, and sweep it around beneath the edge as to cut the capsule in more than one-third of its periphery on the same side that the section has been made.

My next step is the drawing back of the iris and the extraction of the lens. At this point I wish to saw a few words in rference to my method of the retraction of the iris with the little instrument called the "iris retractor," which I now present, claiming that I first adopted and practiced this method. In the *Archives of Ophthalmology*, May, 1888, page 60, Dr. Herman Knapp states that before and since he read his first paper on this subject, he had drawn back the iris toward its periphery, where he found that membrane somewhat rigid. using the small wire loop; but he does not state that he held the iris *drawn back* until the lens was removed, so I infer that he simply drew it back to relieve its rigidity, or to break up any adhesions that may have formed between the iris and the anterior capsule.

Again, I find an article by Dr. Barton Pitts, of St. Joseph, Missouri, in the *Medical Record*, October, 1890, wherein he describes a method of operation by which he draws back the iris with the same wire loop which Dr. Knapp used, and held it there until the lens passed out by pressure on the cornea. In the same paper Dr. Pitts criticises my retractor, when, according to his own admissions, he has never seen my instrument, nor does he even know its construction, but has simply followed out my ideas of drawing back the iris and holding it *tucked back* until the lens is removed. He does not give me

the credit of having first adopted that procedure though his ideas may be original with himself.

I will quote Dr. Pitt's words: "By Dr. Valk a distensible shield with two knobs is proposed. The method of its manipulation is to insert through the corneal wound, cover the surface of the iris, and, by the knobs holding in the pupil, retract the iris upward as far as necessary and slide the lens over the front surface of the shield. Dr. Valk reports good success with it. I have not tried it, nor am I familiar with its pattern except from description. I should think, however, it objectionable on the score of occupying considerable space, already too limited. Its insertion, moreover, I think awkward, and, in the event of sudden movement of the eye under operation, its presence in the anterior chamber especially dangerous. * * * To overcome the resistance of the iris and frequent rigidity of the pupil, I have for two years resorted to the same instrument recently mentioned by Dr. Knapp as used by him—that is, a fine wire loop attached to a delicate handle. This instrument, which can be easily and thoroughly sterilized, I insinuate through the corneal wound into the pupillary space and retract the iris into the superior triangular space, and by a gentle pressure backward and upward of a strabismus hook, applied against the lower edge of the cornea, I have little difficulty in the delivery of the lens and without material injury to the iris, and in no instance accompanied by loss of a single drop of vitreous, or followed by septic infection of the eye." I have quoted his remarks thus fully that you may note the different methods, and also if this little instrument is at all objectionable because it occupies too much space, or is especially dangerous in any sudden movements. I have never found it so, and in reality this retractor of mine does not take up any more room than the wire loop; nor is it *awkward* in any sense, as it can be easily removed from the eye by simply tipping up the ends of the blades, thus instantly releasing the iris, and at once removed if necessary.

It seems to me that the construction of this little instrument is extremely simple, having only two small smooth knobs on

the ends of a forceps with crossed action, and the size of the ordinary iris forceps. These little knobs, standing at right angles to the axis of the ends of the blades and pointing downward, simply hold the iris tucked back in the superior triangular space until the lens passes into the corneal wound, when the iris is at once and easily released.

When we consider the ease with which the lens passes out and the slight pressure required on the cornea—so much less than in the simple extraction universally adopted at the present day—I feel justified in claiming some merit and originality for this little retractor.

The eye being now ready for the extraction of the lens, it is grasped by the fixation forceps, directly opposite the section, and held steady by a careful assistant. I now take the retractor in the left hand, and, with the blades closed and the set screw so arranged that the blades will open to about the diameter of the pupil, I insinuate the ends through the section to the pupillary space. The blades are now opened by pressure and the iris is drawn back and tucked beneath the edge of the lower corneal section. Holding it steady in that position, a slight pressure is made on the opposite side of the cornea by a spoon or hook, causing the lens to rise up and easily pass out over the ends of the blades. As it does so, and as soon as the lens presents itself at the section, the retractor is pushed slightly inward, at once releasing the iris. The retractor is then generally removed with the lens lying in the cavity of the blades. As the lens clears away, we find the iris back in its position, not injured in any way, nor has it been exposed to the air, as may occur in simple extraction.

In case there should be any cortex remaining which I do not think will be absorbed or will interfere with the vision, I have reintroduced the retractor, and, drawing back the iris again, these masses are easily pressed out with the spoon. This completes the operation, and, the section being in perfect apposition, the speculum is removed, the eye gently closed, and the bandage applied.

After-Treatment.—There seems to be much diversity of

opinion as regards the method of after-treatment of an operation at the present day as there is in the methods of operation, even so far as not to use any bandage or dressings of any kind. I note that Professor Knapp does not close the eye until about half an hour after the operation, in order to see if there is any tendency of prolapse. He only applies the cotton and isingglass slips, while Chisolm, of Baltimore, does not even apply any cotton; but as I have watched the healing process of my cases and noted the different conditions under which my patients have from necessity been placed, I am inclined to think that it is best to take a "happy medium" with a decided modification of the old strict method in use some years ago. Our first consideration must be the ultimate success of the operation, and next the daily comfort of our patients as the healing process proceeds. Bearing these two points in mind, it seems to me that there will be fewer movements of the eye and consequently less pressure on the sclera by the straight muscles if we close both eyes with a neat-fitting flannel bandage, with pads of absorbent cotton over the eyes. The slight restraint of a day or two in bed will not cause any distress, while the rest and quiet will assist in the rapid healing of the large corneal wound. I do not doubt but that those who use the modified dressings have as good success as can be wished for, though the above ideas seem to me the best that we may employ to complete the healing of our patients, according to the old motto, *Tuto, cito et jucunde.*

I remove the bandage from the eye not operated upon at the end of forty-eight hours, or on the second day, as I do not wish, nor do I see any need, to keep these old people in the dark any longer than is absolutely necessary.

In my last four cases I have tried to carry out my idea of non-interference still further, as I sometimes think that atropine may irritate an eye which has been operated upon for cataract, and lately I have not used this drug unless necessary —that is, when there were indications of commencing iritis; but I have changed the bandage every twenty-four hours, washing the lids carefully and gently with warm water, apply-

ing a little vaseline to the edges of the lids, and then replacing the bandage.

Now I wish to make another suggestion in reference to that desire, which we perhaps all have, to look at the eye and to see the result of our work. Is it not better to leave the eye alone until all possible danger of complications has passed? Some of us have noted an opening of the wound with prolapse of the iris as late as the sixth day after the operation. Therefore I have decided to simply change the dressings every day for about ten days, unless there are some indications otherwise, and then open the eye in a darkened room, gradually accustoming it to light by the use of smoked glasses.

Professor P. D. Keyser, of Philadelphia, and Dr. W. Buss, of Bradford, Pa., have used my retractor in several cases and have reported to me good results, each being pleased with the easy exit of the lens and the rapid healing of the wound in the cornea.

In conclusion, I do not think the surgeon who considers the best interests of his patients and the various conditions that may arise during an operation for the removal of cataract will persistently adhere to any one method of operation. In my own cases I have been compelled to lay aside the retractor in four cases out of thirty-three. So the surgeon must adopt that method which to him at the time seems best for the ultimate success, either with or without an iridectomy; but we can adopt some method and endeavor to carry it out, unless we find it will endanger the final results.

Some of my cases have required a subsequent discision; but as each case of that kind requires special study and methods in itself, I will not make any particular reference to it, except so far as I consider Dr. Knapp's remarks as to the operation, delivered at Detroit, as the best, and giving the finals results required.

In all my cases I have used the *retractor*, though some of them have presented indications almost against its use; but the final results have seemed equal to those of any other method, while in four cases not reported I could not use the retractor

and the final results were not as satisfactory, and in one case, where I performed an iridectomy, the end was total loss.

This method is perfectly safe and the retractor can, if necessary, be quickly and easily removed from the eye, while the objection once raised, that it is another instrument introduced into the eye, is not tenable, as this instrument is so easily sterilized, and, besides, I think there is less manipulation of the iris than in simple extraction, particularly if the iris is prolapsed at the exit of the lens.

Final results in twenty-nine cases: $^{20}/_{20}$—, 1; $^{20}/_{30}$, 2; $^{20}/_{40}$, 8; $^{20}/_{50}$, 5; $^{20}/_{70}$, 3; $^{20}/_{100}$, 4; shadows, 4; no result, 1; no test, 1.

I will close by stating that by this method I do not meet with any more accidents or risks, or loss of vitreous, etc., than usually occur by other methods, and I believe that with careful use the retractor, as I now present it and as I have used it for the past four years, will be of material service to the ophthalmic surgeon in the removal of a cataractous lens.

The instrument may be procured from E. B. Meyrowitz, of New York.—New York *Medical Journal.*

THE PROXIMATE CAUSE OF THE TRANSIENT FORM OF MYOPIA ASSOCIATED WITH IRITIS. WITH REMARKS ON OTHER FORMS OF SYMPTOMATIC AMETROPIA.[1]

BY A. SCHAPRINGER, M.D.

The clinical fact that iritis in a considerable proportion of cases is apt to occasion a transitory myopia of low degree—about 1.5 D. to 2.0 D.—was first put on record by Dr. John Green, of St. Louis, the well-known authority on questions connected with refraction. Since the time that he read his paper on this subject before the American Ophthalmological Society in 1887 his discovery has been verified by a large number of other observers.

As to the proximate cause of the increase of refraction as a symptom of iritis Dr. Green did not offer any speculations.

In a paper on Symptomatic Myopia, read before the American Ophthalmological Society in 1888, Dr. W. F. Mittendorf advanced the theory that this transient increase of refraction was the result of an infiltration of the anterior portion of the vitreous body, increasing the bulk of this organ to such a degree as to push the lens system forward and with it the posterior principal focus of the eye. This theory I do not feel inclined to adopt, because as long as the tensile strength of the suspensory ligament of the lens remains unimpaired, an increase of pressure in the vitreous chamber would have to be very great indeed to displace the lens forward. The globe would feel very hard on palpation, other symptoms consequent

[1]Read before the Section in Ophthalmology and Otology of the New York Academy of Medicine, October 16, 1893.

upon increase of tension would be present, and there would be hardly any difference in the clinical pictures of iritis and acute glaucoma.

According to another theory, the increased refraction is said to be due to an augmentation in the corneal curvature produced by the increased pressure of the lids in consequence of the great photophobia. The negative results of ophthalmometric measurements completely disprove this theory.

Still another hypothesis alleges a spasmodic condition of the ciliary muscle as the cause of the symptom in question. This hypothetical cause forming the base of certain therapeutical recommendations lately made by Dr. Gharles A. Oliver, of Philadelphia,[2] the question of the correctness of this hypothesis must henceforth be regarded as not merely of theoretical but also of practical interest.

Dr. Oliver insists that the refraction of the eye should be carefully and repeatedly tested in the course of an attack of iritis, and that instillation of strong mydriatic solutions should not be discontinued as long as the increased refraction persists, even after the pupil has been fully dilated. The presence of myopia proves the presence of spasm in the muscle of accommodation, and this being a pathological condition, it needs to be combated by the appropriate means at our disposal.

Now, Dr. Green has already pointed out that the fact that the increase of refraction persists for an indefinite time after the pupil has fully yielded to the action of atropine was a proof militating against the assumption that the transient myopia was due to spasm of accommodation. Besides this argument advanced by Dr. Green, the supposition that inflammation will cause a spasmodic contraction of the ciliary muscle is contrary to all physiological experience in regard to analogous conditions elsewhere in the human organism. To bring forward only one example, let me refer to the behavior of the muscular coat of the intestine in peritonitis, where it is any-

[2]La correction exacte des vices de réfraction dans l'iritis plastique. Annales d'oculistique, January, 1893.

thing but contracted. On the contrary, it is completely paralyzed, and by its paralysis causes two of the main symptoms of the disease, tympanites and constipation. The contraction of the pupil in iritis is not due to spasm of the sphincter iridis muscle, but is only dependent on the swelling of the tissue of the iris in consequence of hyperæmia and infiltration. It is also a very significant fact in connection with the question here discussed that in the insidious forms of sympathetic iridocyclitis the first sign of impending trouble is the *diminution* of the power of accommodation, causing recession of the near point.

Having dismissed all the theories hitherto enumerated as unsatisfactory, it behooves me to substitute one against which no valid objections could be raised. I think that the transient myopia of iritis can be best explained by a temporary increase of the refractive index of the aqueous humor. That the composition of the contents of the anterior chamber in iritis differs from that in the normal state is not a hypothesis, but a fact. The formed particles suspended in the aqueous humor, rendering its aspect turbid, will, of course, have no influence upon the refraction of the eye. We are here concerned only about the transparent part of the liquid. Judging from the deposits, among other substances, of fibrin upon the walls of the anterior chamber, nothing would seem more plausible than to assume that in iritis the aqueous humor contains this substance in more than the normal quantity. If this is the case, it follows from physical laws that its index of refraction must be increased. A higher index of refraction of the aqueous will produce myopia, because the beams of light which receive an inclination toward the optical axis, when refracted at the anterior corneal surface, will receive an additional inclination toward this axis at the posterior corneal surface. In the normal state there is no refraction at this surface, because then there is no difference between the refractive indices of the cornea and of the aqueous humor. The posterior wall of the cornea in iritis represents a convex refracting surface with a medium of higher refrangibility behind it than before. Consequently

the optical conditions present at this surface will be the same in kind, though not in degree, as those present at the posterior surface.

In the refractive index of the aqueous humor of an emmetropic eye were lessened instead of increased, the inclination of the rays of light toward the optical axis would be diminished and the eye therefore rendered hypermetropic.

The question now presents itself, How much must the index of refraction of the aqueous be increased in order to produce a given degree of myopia?

In order to solve this problem, we have to take into consideration the factors coming into play at the refraction by the posterior corneal surface. The relation of the constants is expressed by the well-known formula:

$$F_2 = \frac{n_2 r}{n_2 - n_1}$$

We wish to calculate the value of n_2, which represents the index of refraction of the aqueous humor:

$$n_2 = \frac{F_2 n_1}{F_2 - r}$$

F_2 represents the second principal focal distance of our refractive system, consisting of corneal substance, posterior corneal surface, and iritic aqueous, or, in other words, the collective power of this system. This collective power is measured by the concave glass placed before the eye, neutralizing the collective power by its dispersive power. In substituting the reciprocal value of this glass, we have to deduct the distance of the correcting glass from the posterior corneal surface.

n_1 stands for the refructive index of the corneal substance, which is 1.3365 according to Helmholtz.

r represents the radius of curvature of the posterior wall of the cornea, which, following Tscherning, we will put down as six millimetres.

Carrying out the ealculation for different degrees of myopia as met with in iritis, we find the following values of n_2:

DEGREE OF MYOPIA.	INDEX OF REFRACTION OF AQUEOUS.
1.0 D	1.355
1.5 D	1.349
2.0 D	1.353

The increase from the normal—which is 1.336—not being considerable, the figures at least do not speak against the plausibility of our hypothesis.

If we accept this hypothesis as the true explanation of the myopia occasioned by iritis, we shall refrain from continuing the instillations of atropine after the pupil has fully yielded to its action and the congestion has subsided, although the myopia may still be present. Our theory furnishes a contraindication against the persistent employment of atropine under these circumstances, inasmuch as a dilated pupil means an obstructed iris angle, and this means interference with the drainage of the anterior chamber. We shall not feel inclined to do anything to keep the morbid aqueous humor longer in the anterior chamber than necessary. Our hypothesis furthermore does not impose upon us the obligation of carefully and repeatedly testing the refraction of eyes affected with iritis, of which release we shall avail ourselves with avidity and earn the thanks of our patients.

If the myopia persists for some time after the subsidence of the inflammatory symptoms and we should feel called upon to hasten the work of Nature, massage of the eyeball would offer itself as a local therapeutic measure in consonance with our theory.

The two recognized varieties of myopia in general are axial myopia, which is the most common form, and myopia of curvature. If our theory as to the causation of the transient nearsightedness occasioned by iritis is verified, we shall have "index myopia" as a third type of this error of refraction.

To test the merits of the theory here propounded, very accurate measurements with instruments of precision rarely met with in the possession of practitioners will be necessary. Those

who have a Helmholtz ophthalmometer, or what seems to be a still more suitable instrument for the purpose, a Tscherning ophthalmophakometer at their disposal, will deserve the thanks of the profession by taking up this problem. The shortest way to determine the refractive index of iritic aqueous would be to tap the anterior chamber and test the liquid obtained by means of an Abbé refractometer; but the clinical indication for paracentesis of the cornea hardly ever arises in the course of plastic iritis.

Since we are discussing the subject of index ametropia, the question naturally suggests itself, What would become of an emmetropic eye if the index of refraction of the vitreous body be increased?

The answer to this question will be found in the following consideration:

The beams of light, striking the concave anterior surface of the vitreous, are deflected toward the optical axis to join it at the place of the retina. The strength of the deflexion depends upon the difference of the refractive indices of the crystalline body and the vitreous. The index of the vitreous being the lesser quantity, we will, by increasing it, lessen the difference between it and the crystalline index, or, in other words, lessen the inclination of the rays of light toward the optical axis. This means that the emmetropic eye is being rendered hypermetropic.

A change in the refractive index of the vitreous will therefore cause the opposite effect from that which is produced by the same kind of change in the aqueous.

In the intervals between the prodromic attacks preceding an outbreak of inflammatory glaucoma the patients usually complain of being compelled to use increasingly strong convex glasses in rapid succession for reading purposes. This is usually explained as the result of a rapid diminution in the power of accommodation, but it seems to me not improbable that this symptom may have something to do with an increase in the refractive index of the vitreous body. Such an increase in the refractive index of the vitreous body. Such an increase, as

said before, will render an emmetropic eye hypermetropic, and a hypermetropic eye still more hypermetropic. I have met nowhere with the distinct statement from any observer that, while the near point of the glaucomatous eye thus rapidly receded, the far point was found to remain stationary.

The myopia caused by diabetes is a form of myopia to which Hirschberg has called attention and which is probably also a type of index ametropia. I have myself recently met with two cases of this kind in succession—one of them in a lady sixty-one years old, referred to me by the kindness of Dr. S. J. Meltzer, of this city. The acquired myopia in both cases was of considerable degree, being more than 6 D. An increased curvature of the front surfase of the lens I can hardly deem accountable for this, since the depth of the anterior chamber, at least as far as could be made out without the use of the instruments of precision mentioned before, seemed perfectly normal in both cases. A decrease in the refractive index of the cortical substance of the lens will, I think, best account for this type of myopia, if the myopia is to be accounted for by a change in this organ. Such a decrease will increase the refractive power of the lens system as a whole and thereby bring the posterior principal focus of the eye in front of the retina. It may sound parodoxical at first that the collecting power of a biconvex lens like the crystalline body should be increased by a decrease in the refractive index of one of its constituent parts. But it must be remembered that the cortical substance represents a system of concave or dispersive lenses which neutralize the overstrong collective power of the globular nucleus. By lowering the refractive index of the cortex we lessen its dispersive power, and the result will be a preponderance of the collective power of the nucleus; the principal focus of the eye is thereby brought forward and the eye made myopic.

Since writing the foregoing my attention has been drawn to a paper, "On the Presence of Sugar Within the Eye in Ex-

perimental Diabetes,"[3] by the brothers Cavazzani, an abstract of which has recently appeared in the *Centralblatt f. prakt. Augenheilkunde* (supplement for 1892, p. 496). Having made experimental researches on the functions of the pancreas, these authors report the results of the chemical analysis of the refracting media of two dogs which were afflicted with a permanent form of diabetes in consequence of the extirpation of the pancreas. The animals were killed in due season and their eyeballs enucleated. In the first dog the aqueous humor contained 0.386 per cent. of sugar. In the peripheric layers of the lens very little of this substance was found, *and none at all in the nuclear portion of the lens and the vitreous body.* In the second dog sugar in the proportion of somewhat less than 0.5 per cent. was found in the aqueons humor and none at all in the other refracting media.[4] The lenses were completely transparent and anatomically normal in every respect. The fact that the lens, at least of one of the animals, contained sugar, speaks against the theory enunciated by Deutschmann,[5] which says that no sugar can diffuse into the substance of the lens as long as the epithelial layer of the lens capsule remains intact.

In the investigations of the Italian experimenters, at least as far as they are reported in the *Centralblatt*, no attention was paid to the refraction of the eyes during life or to the refractive index of the media subjected to chemical examination. I hope that in future investigations of the same kind these matters will not be lost sight of. The results of the chemical analysis make it probable that the aqueous humor at all events plays an important part in the production of diabetic myopia. Future investigations will have to show whether the peripheric layers of the lens are also concerned in this change of refrac-

[3]This is a portion of a larger work, Le funzioni del pancreas ed i loro rapporti colla patogenesi del diabete. Venezia, 1892.

[4]From the marked difference in the chemical behavior of the aqueous and the vitreous the authors draw the conclusion that the sources of nutrition of these two substances must be entirely distinct.

[5]V. Graefe's Arch. of Ophthalm., 1887, p. 229.

tion and how far. It is very characteristic that the vitreous body of the diabetic dogs was found absolutely free from sugar. This is in remarkable harmony with what was pointed out before on theoretical grounds, viz., that the degree of myopia produced by an increase of the refractive index of the aqueous humor will not become further increased by an increase of the refractive index of the vitreous body, but, on the contrary, an increase of the refractive index of the vitreous would neutralize, more or less, any myopia caused by a change of index of the aqueous humor.—New York *Medical Journal.*

REVIEWS.

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